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ABSTRACT

Contained in this curriculum manual are guidelines for incorporating energy conservation into regular classroom programs. To be most effective in teaching an energy ethic, a problem-solving approach is recommended which uses the expertise of each discipline. Also presented are general program goals, cognitive objectives, and affective goals for an energy conservation education program. The appendix includes energy survey results and an energy project evaluation report. (WB)

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ENERGY CONSERVATION GUIDELINES

3 Energy Conservation in the School Curriculum

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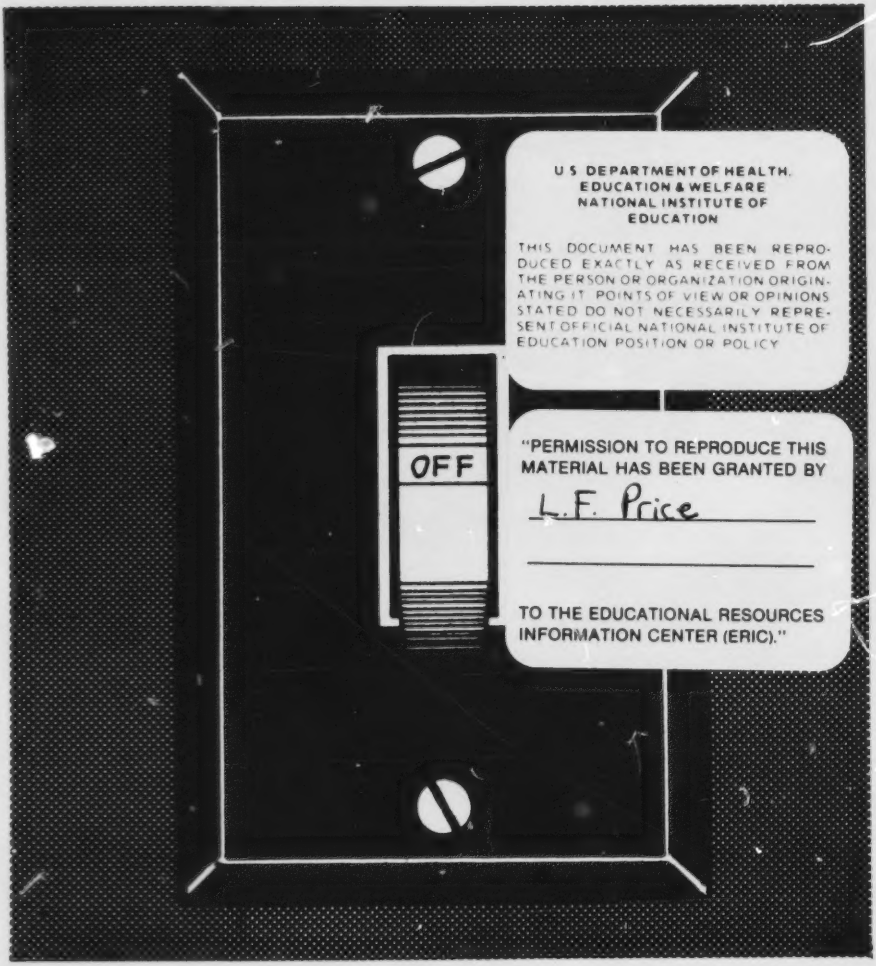

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ENERGY CONSERVATION IN THE SCHOOL CURRICULUM

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FOREWORD

Energy **conservation** as a major topic in school curricula is relatively new, even though *energy* has had a significant place in education since the beginning of man's recorded history. As long as fossil fuels were in abundance at a reasonable cost, knowledge of only the scientific aspects of energy sources was essential. But as energy became less readily accessibe in the western nations, it became more significant in matters of our nation's economy and essential to include in all curricula, not only science. In the past, elementary grade curriculum included the types and sources of energy, and secondary schools focused on sources of energy and how energy is transformed. Today, in economics and vocational curricula, as well as science, a total knowledge of energy and its role in the world is essential to provide a rationale and means for conserving energy in our society.

In recent times a concern developed regarding the numerous undesirable by-products of energy production and use such as air pollution, water pollution, hazardous chemical waste disposal, and others which endanger the environment. Federal and state agencies were formed to protect the environment from these dangers. It was then only natural that an "environmental education" curriculum was developed to be integrated into the curricula at all grade levels. To date this curriculum has included the conservation of natural resources, in general. It has focused on removing all dangers to a healthy environment; preventing the expansion of environmentally undesirable activities, many of which are energy related; and preventing the depletion of limited resources.

In an era of affluence and abundance, the messages of those who express a concern for the environment are not universally heeded. Now that oil resources are less available to the United States, it is clear to most people that conservation, or the careful and efficient use of fossil fuels plus the equally careful and efficient transfer to alternative energy sources, is necessary. This is true from an economic and a practical standpoint. The response in our schools must be at least equal to the environmental conservation efforts which were made when we came face-to-face with pollution problems. Schools have no choice but to incorporate into every aspect of their curriculum the best information available concerning the limited availability of fossil fuels to American citizens, the implications of foreign dependency on oil, the suitability of alternate energy sources, and the economic and other consequences of their inefficient use. The curricula at all grade levels must also provide students with opportunities to consider all relevant factors and trade-offs so that an energy ethic may be formulated by each student. This is essential if the youth of today are to successfully cope with energy problems in the future.

Does an energy conservation curriculum make a difference? The answer is *YES* according to a recent study by the Michigan State Department of Commerce. In two studies of middle school and high school pupils, those who had received instruction in energy conservation gave the greatest support in their responses to a questionnaire on energy conservation measures in and out of schools. Overall, pupils in this age bracket were not found to be supportive (see Appendix A).

Irving M. Peterson, Director
Facility Planning Services

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CURRICULUM DEVELOPMENT

In any effort to write or evaluate an energy conservation curriculum, the following criteria should be considered:

1. Focus on current and future environmental energy issues, employing an interdisciplinary approach.
2. Base the curriculum on sound learning theory, suitable for the particular cognitive capabilities of students at each given age.
3. Provide opportunities for students to analyze ethical and value judgments in decision-making on environmental and energy issues.
4. Develop, in students, concepts and reasoning abilities.[1]

Many of these critieria have been included in descriptions of an appropriate philosophy and goal of an energy conservation curriculum. One of the best statements to this effect is by S. David Freeman in an address to the Boston Conference of the Interstate Energy Conservation Leadership Project in early 1975, which was published later that same year in the first edition of this booklet (see Appendix B).[2]

GOALS AND OBJECTIVES

In the N.J. commissioner of education's energy task force preliminary report in 1977, the following goals, cognitive objectives and affective goals were identified:

Goals:

1) To develop an understanding of the basic vocabulary used in discussing energy and its usage.
2) To develop an understanding of our energy sources and the supply of each.
3) To develop an awareness of the increasing demands for energy.
4) To increase an awareness of the individual's responsibility in conserving our energy resources.
5) To develop an awareness of ways by which individuals, businesses, industry, and others can reduce their demands for energy without adversely affecting life styles.

Cognitive Objectives;

Following the study of this unit, students will be able, on multiple-choice questions, to select a choice:

1) indicating that they realize that heat, light, and electricity are all forms of energy.

2) match any or all of BTU, calorie, and kilowatt-hour with ways we measure energy.
3) indicate they understand that the energy in food originally comes from the sun.
4) will select home heating system as the greatest user of energy within the home.
5) will select gravitational energy as the form of energy that moves things like sleds down hills.
6) will select industry as the greatest consumer of energy in our society.
7) will indicate that more energy is required to make aluminum containers than is required for making containers from other common materials.
8) will select a choice indicating they understand items such as electric toothbrushes require much more energy for their manufacturing than for their operating.
9) will select buses as the method of travel between cities that require the least energy per mile a person travels.
10) will select pipelines as the method requiring the least energy to move liquids over great distances.
11) will be able to identify the sources of fossil fuel energy.
12) will be able to identify the major sources of energy being presently used in the United States.
13) will select nuclear fuel as a likely source for much of our energy 50 years from now based on present projections.
14) will select coal as the form in which the United States has the greatest supply of stored energy.
15) will select a choice indicating they understand that energy is changed from one form to another in electrical generating stations.
16) will select a choice indicating we change our energy supply from one form to another to make the energy easier to transport and use.
17) will select an item not made from crude oil from a list of items made from crude oil.
18) will select a choice indicating that as people develop more industry, knowledge, and become richer they use more energy.
19) will identify increasing population, changing life styles, and decreasing of our present sources of energy as causes for the energy crisis.
20) will select a choice indicating that as we continue to use more energy pollution will continue to be a problem.
21) will select making throw-away containers as one way energy is wasted by industry.
22) will select requiring pollution control devices as the best way to control pollution without damaging our economy.

Affective Goals:

Following the study of this unit, students will reflect a positive attitude toward the following concepts:

1) Individuals should not waste energy.
2) Individuals should buy the most energy efficient products.
3) Pollution from energy production and usage must be controlled even if it requires using more energy.
4) U.S. citizens must become more aware of the sources of energy and the amount of each source available.
5) The use of energy should be regulated by laws.
6) Energy usage should be regulated by changing its costs.
7) We should be concerned about the energy resources for future generations.[3]

In 1976 the National Science Teachers Association recommended "that four primary goals be followed in integrating energy into the curriculum." Each "Student-citizen" should:

1. Come to "understand the science and technology of energy and its pervasive role in national and world society."
2. Become capable of making "informed political decisions which are consistent with energy realities."
3. Be encouraged to "make personal life-style decisions which are consistent with energy realities."
4. Become "aware of and prepared for employment opportunities in energy related industries."[4]

CONCEPTUAL STATEMENTS

In addition to well-defined goals and objectives, similar to those in the preceding paragraphs, an "energy-focused environmental curriculum" needs to clearly make "six key conceptual statements" as follows:

1. One and all are dependent on energy.
2. There are many sources of energy.
3. Energy can be converted from one form to another.
4. Man's uses of energy create an impact on the environment.
5. The earth's resources are limited.
6. New energy sources and more efficient systems, accompanied by different consumption practices, can alleviate the world energy crisis.[5]

VALUES AND AN ENERGY ETHIC

One thought which surfaces in the literature and in every meeting regarding energy conservation curriculum is the need for instilling an energy ethic in the minds of people, youth in particular. As was stated by S. David Freeman in the first edition of this publication.

> Conservation must become a new ethic in American life. Saving energy and materials in general must become as much an ingrained habit in what we do and what we build as growth and lavish consumption have been in the past. . .Energy-Saving means (among other things). . .developing goals and values for life that are less materialistic.[6]

An excellent approach to teaching values is through debates and problem-solving situations involving real (preferably) or plausible crises. The present energy crisis presents a very real situation which should be analyzed and debated by students in all grade levels and curricular areas as it presently affects the students' lives from where to live, where to work and where to go on vacation to more global questions. Of great concern to our nation is its financial and political strength and influence in the world. A variety of strategies for supplying our nation with energy from numerous resources must be considered. Students need adequate opportunities to fairly and thoroughly study the pros and cons of continued dependence on petroleum products, nuclear energy as an energy source for electric power, conservation practices, etc.

In "A Review of Energy Education Recommendations by University Faculty from 32 University Graduate Schools" by Dr. William Stevens (August, 1979), a study was made to clarify the results of the federally funded Energy Extension Service Youth Project of the Michigan Department of Commerce which analyzed and evaluated several energy education strategies in Michigan Schools (see Appendix C). One of the questions asked was if one were in charge of managing an energy education project what percent of the funds would be allocated to a Drama Program, Teen Awareness Teams, the "Energy Today and Tomorrow" program,[8] Teacher Training, and Task-oriented materials instruction. The survey concluded that almost all funds should go toward **teacher training** and **task oriented materials instruction.** The larger portion of the funds should go toward "actual student involvement in conservation with subsequent real world reinforcements."[7]

One difficulty often experienced in teaching an energy ethic in schools is the discrepancy between what is learned in the classroom and what is experienced in the school facility as a whole, if energy-saving measures have not been adopted. How efficiently a building uses energy teaches students a community's commitment to energy conservation.

If a school building, by virtue of the absence of an energy conservation plan to operate, maintain and retrofit buildings to avoid energy waste, "advertises" an indifference to the energy crisis, it is extremely difficult to effectively teach an energy conservation ethic in the classroom. An essential partner to an energy conservation curriculum is an energy conservation plan for the school facilities which includes a commitment by the board of education and school administration, a plan of action to identify areas of waste, the formation of school-level committees to implement the plan, a means of analyzing (auditing) school buildings, the continued update of the original plan and frequent recognition for all successful conservation efforts.[9]

Students should be given a good example and should be encouraged to participate in all energy-saving activities in the school facilities. Careful use of lights with zones which allow lights to be on only where necessary and with signs to constantly remind people "If you're leaving this room, switch the light off," can often save up to one-quarter of an electric bill while also demonstrating to students a commitment by the school administration. Similar savings can be realized in heating and cooling school buildings with students and staff keeping doors and windows closed as much as possible during the heating season and in air-conditioned areas. A total commitment is needed, followed by the application of basic energy saving practices in the operation of schools. This will enhance the learning and acquisition of an energy ethic by students and should carry over into energy conservation practices in the home and community.

INTERDISCIPLINARY APPROACH

It has been clearly demonstrated that the energy crisis affects all curriculum areas. Therefore, it is essential that studies in all disciplines in all grades include some aspect of the energy crisis. Students of all ages need a good understanding of the source, generation, use, limited availability and factors affecting cost, economics, international impact and need for conservation of energy. What needs to be learned concerning energy is too extensive for a single grade level.

In a similar manner, no single *discipline* can possibly cover all that needs to be learned concerning energy. Having a separate elective course in "energy" is questionable since it does not directly affect all students, as it must, throughout their formal education. The most effective approach is one involving all disciplines, singly and in an interdisciplinary and cooperative manner whenever possible.

Much work has been done to develop energy curricula, but more work is needed. A few resources currently available may be found in the references at the close of this booklet. Additional references and information on specific curricula in use around the United States may be obtained from the New Jersey State Department of Education, Division of School Programs.

SUMMARY

Energy is a significant issue in America today and will be in the years to come. It is also comprehensive enough to warrant an important place in a school's curriculum at all grade levels, in every course offering, and throughout each school year. To be most effective in teaching an energy ethic to every student, a problem-solving approach is highly recommended as well as an interdisciplinary approach to the teaching-learning process which capitalizes on the strengths and expertise of each and every discipline represented on a school's faculty.

A variety of curriculum materials have been written for energy conservation for elementary and secondary schools, and adult education. A listing may be obtained from the New Jersey State Department of Education, Division of School Programs (609-292-8776). For information about the various energy programs of the Department's Division of Vocational Education, call 609-292-1749. Vocational programs include the funding of select exemplary programs and pilot programs across the State, a mobile energy exhibit (now presently housed at a camp in Sussex County), energy inservice programs for instructors of building trades and carpentry (e.g. home weatherization), and a home economics unit regarding energy conservation in home management. Other projects receiving financial support from the Division of Vocational Education are listed in its 1979 publication of project abstracts and services of the Division.

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[1] Louis A. Iozzi, "A Discussion Paper: Energy Education Needs for N.J. Schools" (New Brunswick: Rutgers Univ. Institute for Science Technology-Social Science Education, 1977), p. 6.

[2] N.J. Dept. of Education, *Energy Conservation in the School Curriculum* (Trenton, N.J.D.E., 1975), pp. 3-7.

[3] N.J. Dept. of Education, *Commissioner's Energy Task Force: Preliminary Report,* Appendix B, "Environmental Education Curriculum" (Trenton: N.J.D.E., 1977), pp. v-vi.

[4] American Association of School Administrators, *School Energy Crisis: Problems and Solutions* (Washington, D.C.: A.A.S.A., 1977), p. 73.

[5] N.J. Dept. of Education, *Commissioner's Energy Task Force: Preliminary Report,* Appendix B, "Toward an Energy-Focused Environmental Curriculum" (Trenton: N.J.D.E., 1977), p. 2.

[6] N.J. Dept. of Education, *Energy Conservation in the School Curriculum* (Trenton: N.J.D.E., 1975), p. 6.

[7] William Stevens, "A Review of Energy Recommendations by University Faculty from 32 University Graduate Schools" (Lansing, Michigan Dept. of Commerce, August, 1979).

[8] The Energy Today and Tomorrow program is a federally funded energy awareness program developed by Oak Ridge Associated Universities.

[9] American Association of School Administrators, *School Energy Crisis: Problems and Solutions* (Washington D.C.: A.A.S.A., 1977), p. 51.

APPENDIX A
EXCERPTS FROM TWO SURVEYS BY THE MICHIGAN STATE DEPARTMENT OF COMMERCE

1. Youth Energy Survey, March 1979 Pilot

The. . .report presents data on the energy conservation attitudes and behaviors of approximately 42,400 high school (grades 9-12) students from 161 schools in eight states who completed the Youth Energy Survey (Y.E.S.) in March, 1979. . .

General Findings

The survey findings. . .suggest that: 1) there is a need for intensive energy education efforts, 2) such efforts **can** affect students' energy conservation attitudes and behaviors, 3) there is a relationship between factors such as grade and sex and energy conservation attitudes and behaviors, 4) there are certain ways to group energy conservation-related content that is most meaningful to students, and 5) these findings, combined with research currently being pursued by this office, indicate that energy conservation education efforts can indeed encourage students and their families to actually save energy.

The Need for Energy Conservation Education

Results indicate that high school students in general are not strongly inclined toward energy conservation. For example, on a five-point response continum where one represents the most negative attitude toward energy conservation and five represents the most positive, the overall score average for all students surveyed is 3.27. Even the highest overall group average, twelfth grade females, was 3.35, slightly higher than "undecided" on the response continuum.

While it is gratifying to know that students as a whole are definitely more positive than negative about energy conservation, there is clearly a need for instruction in the area of **attitudes** toward energy conservation.

Indeed, one of the encouraging findings is that students who have received instruction in energy conservation scored higher on the Y.E.S. attitude test than who have not been instructed in this area.

Examining Factors Related to Conservation Attitudes and Behaviors

Conceptualizing Energy Issues

While educators might plan lessons on energy, organized in seemingly logical topical units, if the organization or these ideas is not consistent with the way students view energy issues such instruction might prove ineffective. By examining the results for students who took the Youth Energy Survey, there seem to be nine major issues that are viewed as most important to these students.

If educators plan their energy units around the concepts to which students will be most responsive, energy education efforts can prove more rewarding. The descriptive names assigned to the groups of items which represent these nine major concepts are: Automotive Conservation; Lack of Personal Responsibility and Sacrifice; Solar; Willingness to Make a Specific Commitment; Government and Taxes; Nuclear Energy; Air Conditioning; Jobs; and General Feasibility and Favorability.

Students Who Have Received Energy Conservation Instruction

Over the entire sample, 47% of the students surveyed report having had energy conservation instruction in one or more courses. This percentage might be slightly higher than the true average for students in these states since many of the students who took the survey did so in classes where their teachers volunteered to survey their students (i.e., teachers who volunteer might be more interested in energy conservation than the average teacher and hence more likely to have taught such topics to their students).

Additional interesting findings include the fact that more males than females report having had energy conservation instruction. Within grades, more ninth graders have received such instruction than any other students. Twelfth graders come in next, with eleventh and tenth graders following in that order.

More important, however, is the fact that students who have received energy conservation instruction have more positive attitudes toward saving energy. Further, it appears that by increasing the amount of energy conservation education that students receive, it is possible to make even greater gains in conservation attitudes. For example, students who received 10 hours of instruction quite consistently score higher than those who received 2 hours. These findings are very encouraging for the role that education can play in promoting the wise use of energy.

2. Youth Energy Survey, May 1979 Pilot

The. . .report presents data on the energy conservation attitudes and behaviors of approximately 53,144 middle school (grades 6-8) students from 270 middle schools in eight states who completed the Youth Energy Survey (Y.E.S.) in May, 1979. . .

General Findings

The survey findings. . .suggest that: 1) there is a need for intensive energy education efforts, 2) such efforts **can** affect students' energy conservation attitudes and behaviors, 3) there is a relationship between factors such as grade and sex and energy conservation attitudes and behaviors, 4) there are certain ways to group energy conservation-related content that is most meaningful to students, and 5) these findings, combined with research currently being pursued by this office, indicate that energy conservation education efforts can indeed encourage students and their families to actually save energy.

The Need for Energy Conservation Education

Results indicate that middle school students in general are not strongly inclined toward energy conservation. For example, on a five-point response continuum where one represents the most negative attitude toward energy conservation and five represents the most positive, the overall score average for all middle school students surveyed is 3.44. Even the highest overall score average for sixth grade females, was 3.52, about midway between "undecided" and "agree" on the response continuum.

While it is gratifying to know that students as a whole are definitely more positive than negative about energy conservation, there is clearly a need for instruction in the area of **attitudes** toward energy conservation.

Indeed, one of the encouraging findings is that students who have received instruction in energy conservation scored higher on the Y.E.S. attitude test than those who have not been instructed in this area.

Examining Factors Related to Conservation Attitudes and Behaviors

Conceptualizing Energy Issues

While educators might plan lessons on energy, organized in seemingly logical topical units, if the organization of these ideas is not consistent with the way students view energy issues, such instruction might prove ineffective. By examining the results for students who took the Youth Energy Survey, there seem to be nine major issues that are viewed as most important to these students.

If educators plan their energy units around the concepts to which students will be most responsive, energy education efforts can prove more rewarding. The descriptive names assigned to the groups of items which represent these nine major concepts are: Willingness to Make a Specific Commitment, Desire for Family to Conserve, Jobs, Government, Air Conditioning, Solar, Taxes, General Feasibility and Favorability, and Energy Conservation as a Priority.

Students Who Have Received Energy Conservation Instruction

Over the entire sample, 70% of the students surveyed reported having had energy conservation instruction in one or more courses. This percentage might be slightly higher than the true average for students in these states since many of the students who took the survey did so in classes where their teachers volunteered to survey their students (i.e., teachers who volunteer might be more interested in energy conservation than the average teacher and hence more likely to have taught such topics to their students).

Additional interesting findings include the fact that more females than males report having had energy conservation instruction (in at least one course during that school year). Within grades, more 6th graders have received such instruction than any other students. Eighth graders come in next, with seventh grade reportedly receiving the least amount of instruction.

More important, however, is the fact that students who have received energy conservation instruction have more positive attitudes toward saving energy. Further, it appears that by increasing the amount of energy conservation education that students receive, it is possible to make even greater gains in conservation attitudes. For example, students who received 10 hours of instruction quite consistently score higher than those who received 2 hours. These findings are very encouraging for the role that education can play in promoting the wise use of energy.

APPENDIX B

THE PUBLIC SCHOOLS AND THE ENERGY CRISIS *

The Arab nations did us no favor when they ended the oil embargo last spring. If the embargo against the United States had continued over the past year, I have little doubt that by now the first process of painful readjustment would be largely behind us. Americans, as a matter of necessity, would have cut back on their lavish, wasteful use of gasoline, and other forms of energy. The air in our cities would be cleaner. Our balance of trade would be in the black rather than the red. Our foreign policy in the Middle East would not be distorted by worry over another embargo. And other consuming nations might be following our lead to stop the drain of petro-dollars that threatens to plunge the world into a prolonged recession or even depression.

But the oil embargo didn't last long enough for America to withdraw from its addiction to energy. The crisis was pronounced over by President Nixon just about the time the people and the government were beginning to face up to the consequences of a lifestyle utterly dependent on an energy lifeline that can be cut off at a moment's notice. The embargo only gave us a sneak preview of the future. But it was quite a jolt, one that touched the lives of every American. And despite the tendency of most people to go back to sleep on the issue, the energy crisis is not fading away. In fact, it is closing in on us.

The package of problems that we call the energy crisis is ushering in a new era for America and the other industrialized nations of the world. It is an era of scarcity in energy resources and materials. Hopefully, it will be accompanied by a greater abundance in moral values, love and enjoyment of our fellow human beings and the beauty of nature, as well as growth in a variety of knowledge-intensive, socially useful economic activities. But the new patterns of growth are only dimly perceived at the moment while the scarcity of energy and the continued pollution of the planet are harsh realities.

The old patterns of economic growth devoured huge quantities of energy and materials. Such growth is now sputtering to a halt. The recession we are experiencing has a direct connection to the energy crisis because its origins are similar. The Disposable Society is in serious trouble because it is running short of cheap feedstock. And the Durable Society that must take its place isn't even part of the school curricula yet.

It is not often that public policy questions of such profound importance to the welfare of mankind can be connected so directly to the way people live and values they hold dear. But the energy crisis is such an issue, especially if it is perceived in its full dimensions. It is also not often that the public is given a sneak preview of how vulnerable they are before real disaster hits. The painful memories of waiting in line for gasoline, and perhaps more important, the utter helplessness and fear of knowing how bad it might get is perhaps the best thing going for policy makers and teachers alike. These memories combined with the harsh facts of today are quite useful in making mental contact as we try to reshape our public policies and to some extent our way of living in order to avoid a breakdown in our high-energy civilization.

The energy crisis can be the most effective teaching aid of the decade. It provides a handle for teaching students some of the most important lessons they need to learn by relating the issues to fundamental experiences in the students' lives such as where they live, how they get to school, where they go on vacation, what quality air they breathe, and where they will work when they graduate.

Educators of course have a dual interest in the energy crisis. The first is how it will affect the school lifestyle. What temperature should the classroom be? Will there be enough gas for the school buses, for the teacher's car? Will the high cost of fuel be paid at the expense of teachers' salaries? These kind of questions are very real and very important. But they merely illustrate how vitally the energy issue affects every element of society.

The direct impact of the energy crisis on the schools is but the tip of the energy crisis iceberg, the part that is plainly visible. The real challenge and responsibility of public education is to go "below water" so to speak and expose the entire problem with all of its ramifications. But exposing the problem is not enough. We must begin to hammer out a solution.

What is taught about the energy crisis in the classroom is much more important than the room temperature or even the priority a school gets in oil allocations. The energy crisis reflects a set of problems that require changes in attitudes, values, lifestyles, and methods of construction that will require many years to achieve. Unless the next generation of adults learns about the problems and the solutions in their formative years, the future is without hope. We are all going to endure some discomforts as we make the transition. And I don't ask educators or students to ignore their rights or obligations as consumers of energy. I only ask that educators give the highest priority to their role as teachers. And teachers must be extra sensitive to avoid the temptation of always concluding that what's good for the school house must be good for the country.

Teaching about the energy crisis must begin with a statement of the fundamental problems that are involved. They can be summarized as follows:

1) Runaway prices of fuels and electricity that are at the heart of the world's economic woes.
2) Environmental pollution from the exploitation and use of existing sources of energy that poses a clear and present danger to the health of mankind and the beauty of nature.
3) Steadily growing shortages of energy that cast a dark shadow over the prospects for economic growth as it has occurred in the past.
4) The gigantic flow of petrodollars from consuming nations to the oil producers poses a real danger of economic collapse to some European nations and could undermine democratic government or trigger a worldwide depression.
5) Continued dependence by the United States on oil from Arab nations that inhibits our ability to negotiate peace in the Middle East.
6) Problems of social equity between poor and rich Americans and among poor and rich nations that are caught up in the question of the price and availability of energy-issues that test our lip service for an equitable distribution of affluence on this planet.

The energy crisis is thus wrapped up in mind-boggling issues that are cosmic in nature. But we dare not be overwhelmed by the life or death nature of what is at stake. The implications are certainly complex and crucial but the fundamental pathways for solution are beyond dispute and easy to teach.

A worldwide commitment to energy conservation combined with research and development of cleaner sources of energy is the fundamental solution to the energy crisis. Conservation of energy must be the backbone of our policy. Cutting out the waste and extravagance in our use of energy can help solve all of the problems that make up the energy crisis. And without a sharp departure from the promotional policies of the past and the present we will continue chasing our tail and never really catch up. The necessary efforts to clean up and enlarge the world's supply of energy cannot possibly succeed in balancing the planet's energy budget unless we begin to practice conservation.

Conservation must come in three stages:

1) Cutting back on some of the wasteful uses of the cars, homes, and factories that are already built. This phase is limited because there is only so much that can be done with glass houses, gas-guzzling cars and energy intensive industries that were constructed in years past. But savings must be achieved even if it means some discomfort. Rationing is most likely necessary, if substantial savings are to be achieved with fairness to all income groups.

2) For the years immediately ahead incentives and performance standards must be enacted so that new homes, cars, factories take advantage of technology that uses less energy.
3) And for the future, new patterns of economic growth and research and development of new technology must be pursued, so that the energy requirements to sustain a high quality life can be reduced even further.

Conservation must become a new ethic in American life. Saving energy and materials in general must become as much an ingrained habit in what we do and what we build as growth and lavish consumption have been in the past. It's not just a matter of driving more slowly and heating and cooling buildings more moderately. Energy-saving means recycling metals, new designs for buildings, living closer to where you work, and for those who already have "one of each" developing goals and values for life that are less materialistic.

The reasons for teaching and adopting the conservation ethic are basic. If we are to preserve the environment and our freedom of action in foreign policy, and improve the economic health of the nation; if we are to sustain a civilization that is now dependent on energy sources that will peak out in a few short decades; if we are to buy the time to harness the sun and develop other cleaner, long-lasting sources of energy—then we have no other choice. Conservation is essential to the survival of civilization as we know it and wish it to continue.

The final report of the Ford Foundation's Energy Policy Project lays out a program for achieving a cut in the nation's energy growth from the 4.5 per cent of the last eight years to about 2% a year. Congress, and where appropriate state governments, should:

Adopt minimum fuel economy performance standards for new cars, so as to achieve an average fuel economy of at least 20 miles per gallon by 1985.

Enlarge the funding for public transportation, expecially buses which can be built quickly.

Encourage more efficient space heating and cooling by making credit easily available for energy-saving investments in existing buildings, by setting higher standards for insulation and heating and cooling systems, by helping to upgrade building codes and providing technical assistance to builders.

Shift federal research and development money toward energy-conservation technology, and stress government purchases of energy conserving equipment—thriftier cars, tighter buildings, recycled materials and the like.

Encourage industry to conserve energy through prices that reflect the full costs of producing energy and other appropriate measures. This means Congress should eliminate the special tax privileges of the energy industry—oil depletion allowance, expensing of intangibles and special foreign tax credits—all of which constitute subsidies to an already rich industry. It also means abolishing promotional discounts for big electricity users and facilitating on-site generation of power to make beneficial use of waste heat.

Through these and other measures, the nation could bring its energy growth rate down to a more manageable 2% without in any way limiting economic growth, employment or household comforts. This kind of energy conservation program would pay some very handsome dividends for the nation. There would be less investment in new coal mines and oil refineries and drilling rigs and power plants and more investment in energy-saving technologies. The result would be less inflation since investments to save energy are cheaper than investments in getting more. Slower energy growth means that net savings in capital investments over the next 25 years would amount to some $300 billion.

It would also mean that from the present to 1985 the nation could meet energy demand without resorting to developments that threaten grave environmental damage and that threaten the independence of our foreign policy. It would be possible to keep oil imports below today's level and still stop strip mining for coal in the arid West or on steep slopes in Appalachia. Alternatively, the nation could halt new construction of nuclear plants and also preserve the Atlantic and Pacific Coasts from offshore development. In any event we would buy the time to permit all of these energy sources to be developed at a more cautious rate.

These conservation measures are only the more obvious features of a broader restructuring of our economy and changing of values, especially as they relate to material goods. School officials have an important role to play in instilling in young minds that the joy of making something last can be as great as buying something new. It won't be easy. It cuts against the grain, but it is an essential lesson that leads naturally to shifting our preoccupation from possessions to intellectual and human concerns.

The energy crisis doesn't mean a Spartan life but it does mean a slower, more frugal America. There will be energy enough for decent housing space conditioning and basic appliances such as a dishwasher for all Americans if income distribution problems can be overcome. But rather than spending our lives piling up more and more things we can show the world how much is enough for the good life and gain more of our satisfactions from our minds, spirits and relations with other people.

The energy crisis is an opportunity for greatness and service. As a nation which epitomizes waste we can lead the way toward a society that can use resources with intelligent frugality and thus endure. We can begin to discharge our obligations to future generations by stopping our gluttonous exhaustion of resources that must last for centuries. We can avoid putting our own destiny in the hands of the nations who are lucky enough to possess huge oil resources. And we can preserve our most basic resources—the air, water, and the land—for ourselves and our children to enjoy.

The energy crisis and the conservation response offer lessons that can set the tone for American life for the rest of the century and beyond. If properly taught it can bring to the forefront the moral and ethical values that have taken second place in so many of our lives. It can also appeal to the common sense and Puritan ethic that teaches us that a spendthrift nation must eventually come upon bad times. I hope that you will join in the happy adventure of turning this dark cloud into a new pattern of life in America, one that will combine material satisfaction with the greater enjoyment and pursuit of human values.

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*An address by S. David Freeman presented to the Boston Conference at the Interstate Energy Conservation Leadership Project in 1975 and published in *Energy Conservation in the School Curriculum,* a booklet prepared by the Colorado Department of Education and published by the New Jersey Department of Education in 1975 (pp. 3-7).

APPENDIX C

EXCERPTS FROM YOUTH ENERGY PROJECT EVALUATION REPORT*

Summary of Evaluation Results

1. The Energy, Today and Tomorrow was found to have no positive impact on student energy conservation attitudes (ETT actually had a negative impact on students from schools where ETT was shown, see charts on pages 20, 21, 22, 23, and Appendix A).
2. The drama program does not appear to produce improved student energy attitudes (However, the quality of data supporting this conclusion is somewhat limited at present, see charts on pages 22, and 24.)
3. Presentations **by students to students** did not produce more positive energy attitudes. (The small sample limits the strength of these results, see charts on pages 25, and 26.)
4. Participation in Teen Awareness Teams **alone** were not found to produce significantly more positive energy attitudes. (See chart on page 16.)
5. The No Drive contest was found to reduce auto use (for approximately one week) by an average of thirteen percent (13%). (However, only two of ten targeted schools could be convinced to participate for a $500.00 prize).
6. Attendance at meetings outside the school was found to have potential for producing more positive energy attitudes. (However, the data is not strong enough to indicate that such meetings actually *cause* such improvements).
7. Energy Conservation units taught in school classes were found to produce significantly more positive student energy attitudes. (This finding was **the strongest of all conditions studied**, see chart on pages 23, and 27.)
8. The Teacher Training program was estimated to have significant positive impact on student energy attitudes. (Findings are a result of logically linking the significant impact of energy classes cited in point seven above with an evaluation of a similar, but shorter Teacher Training program, see charts on pages 27 and 28.)
9. An education project emphasizing actual performance and monitoring of energy conservation tasks (by youth) was found to produce significantly more positive energy attitudes than participating *only* in educational Awareness teams. (See charts on page 16.)
10. Other Non-EES research documents tasks oriented programs as a strategy that has high potential for producing significantly more positive energy attitudes. (Nine above is one relatively low cost strategy within this category, see Technical Report #1).

11. Testing student attitudes and actions, itself, has a positive impact on student Conservation. (See Chart on page 33) (Other Demographic Analyses are shown on pages 29-32.)

Based on these results the following recommendations were developed.

EXAMPLES OF POSSIBLE STRATEGIES FOR INFLUENCING HIGH SCHOOL TEACHERS TO INCREASE THEIR ENERGY CONSERVATION INSTRUCTION

1. Energy education *"consultants"* could be trained to visit schools and encourage teachers to teach energy conservation.
2. Energy *"committees"* could be formed within schools to deal with energy related issues and promote energy education.
3. Teacher training workshops could be initiated.
4. An Energy Conservation Newsletter for teachers could be developed (by region or statewide).
5. Structured follow-up to teacher training participants (in person, over the phone, or via letter) could be used which would monitor on the amount of instruction and provide a vehicle for complementing and assisting teachers who implemented more classes.
6. Teachers could be provided with task-oriented instructional materials.
7. Organizing teachers (by region, county or school) into energy conservation teacher associations, clubs or groups. These groups could then hold regular meetings where:

   a. Problems would be discussed.
   b. Successes presented.
   c. Certificates of accomplishment awarded by CES staff.

EXAMPLES OF POSSIBLE STRATEGIES FOR INFLUENCING HIGH SCHOOL STUDENTS TO PARTICIPATION IN TASK-ORIENTED ENERGY CONSERVATION PROGRAMS

1. Provide task-oriented instruction to students on:

   a. How to caulk a window.
   b. How to tune a car.
   c. How to weatherstrip a door.

   By having the student physically complete such tasks while being observed by an instructor.

2. Provide instruction to students as to how they can accurately measure their energy consumption.
3. Influencing students to monitor their energy use while (at the same time) the student attempts to conserve energy (see Nancy Leedom's report on pages 10-12).
4. Organize student energy conservation clubs whose purpose is to carry out 1 to 3 above.
5. Provide incentives (i.e. certificates, awards, etc.) for students who complete the above tasks.

CONCLUSIONS AND RECOMMENDATIONS

This study would seem to indicate that an active, task oriented type of learning is best for forming an energy conservation ethic. It should be noted that this type of learning is not the same as projects where students take field trips or build energy pamphlet displays. The study appears to dramatically demonstrate that students must be involved in activities where they actually make efforts to conserve energy and receive feedback on their efforts.

The two week project performed by the task oriented group could very easily become part of a classroom assignment. The potential for positive results is even greater in this environment. For instance, results could be posted on a bulletin board, and the potential for reinforcement from peers would be an extra incentive.

This type of activity need not be restricted to science related classes. It could also occur as part of a home economics or shop class, and many others.

Active learning can also occur in other areas besides home related energy conservation. Some examples are listed below:

1. A similar two week, or longer, project could be performed by students involving automobile usage. They could compare a baseline driving, car-pooled, tuned-up the car, avoided quick starts, drive slower, etc. Odometer readings are very easily obtained. Their parents' cars could also be monitored in a similar fashion. This might even occur as part of a driver education class.
2. Groups of students could be recruited to survey their school building and other school buildings in the community for possible ways to save energy. They could examine the food service, insulation, window treatments, busing, athletics, shrubs for wind protection, thermostat settings, and lighting levels, just to name a few. Baseline readings could be taken before the survey and after implementation of some of their recommendations so that the energy saved would be documented.

3. A "sacrifice" week could occur at a school, which might involve such things as brownouts and reduction of activities. Again, students should be informed as to how much energy was saved. This might lead to wiser use of energy in the future.
4. Students could be instructed in actual energy conservation skills (i.e., how to install weatherstripping, caulking, how to tune an engine, etc.) and then asked to carry out such tasks and monitor the energy saved.

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*These excerpts are from *Youth Energy Education Strategy: A Statistical Evaluation* (Technical Report #4) by William F. Stevens, Martin Kushler, John Jeppesen, and Nancy Leedom for the Energy Extension Service, Michigan Department of Commerce, Lansing, Michigan, February 1979.

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